# Accelerator Systems Division Highlights for the Week Ending October 5, 2001

## ASD/LBNL: Front End Systems

After reaching 8 mA for several hours with the 0.8-mm coated antenna, we installed a new antenna with 0.25-mm coating and reached the same beam current at this power level, limited by the performance of the available rf matcher on the second test stand. We re-installed the 0.8-mm coated antenna and reached up to 14 mA for short times by raising rf power and gas pressure. No systematic effort was made to provide a cesiated surface inside the ion source. The preliminary conclusion is that the thickly coated antenna appears to produce plasma about as well as the 0.25-mm coated ones did and that we should try it out for a much longer time under nominal operating conditions. For financial reasons, however, we have now terminated operations on the second test stand and will have to accommodate such antenna tests in the ongoing Front-End commissioning work.

Recommissioning of the Integrated Testing Facility continued, following the Blue-Box remodeling, and first beam was produced using Ion Source #1 ('startup source'), reaching up to 15 mA beam current so far. We are still experiencing some hardware and/or installation glitches that are being resolved during this recommissioning effort.

Bead pull measurements on the full RFQ structure are continuing with the aim of setting all 80 tuners to their final configurations, creating a flat rf field distribution at the nominal frequency.

Carl Strawbridge visited the Front-End Systems on Oct. 4 to inspect FES hardware and discuss project issues. He declared his agreement with the ETC result for our subproject as finalized on Oct. 2 in a phone conference between R. Yourd and N. Holtkamp/S. Herron.

M. Hechler and P. Gibson are expected to visit us on Oct. 8 - 10 to discuss details of the installation plan and, in P. Gibson's case, to participate in the work with the ion source and LEBT.

## ASD/LANL: Warm Linac

The first 402-MHz klystron is on the manufacturer's test stand and underwent high-voltage DC conditioning and high potting this week. Pulsed conditioning is scheduled to begin on October 5. (WBS 1.4.1.1)

LANL and ASD personnel visited the transmitter manufacturer this week to review and approved the test plan. The first unit is scheduled for testing on December 3. (WBS 1.4.1.1)

JLab personnel continued their tests of the prototype SRF fundamental power couplers. Baking occurred over the weekend, followed by RF conditioning up to pulsed power levels of 300 kW. Problems with the BMEWS transmitter required overtime shifts. We expect to use the SNS prototype high-voltage converter modulator (HVCM) next week. (WBS 1.4.1.1)

Two meetings have been scheduled to review manufacturer design plans for the HVCM build-to-specification subsystems. ORNL ASD has been notified and invited. The equipment control rack will be reviewed in Albuquerque on October 17. The substation and phase controller will be reviewed in Burlington, VT on October 23. (WBS 1.4.1.2)

The electromagnetic dipole (EMD) coils are assembled and ready for potting (Fig. 1). Insertion of the permanent magnet quadrupoles (PMQs) into the drift tube bodies (Fig. 2) was delayed to allow us to measure the phase angle of the PMQ relative to the drift tube stem. Our measurements on two drift tubes indicated phase angles of 0.45 and 0.1 degrees, which is within the PMQ specifications. The PMQ should be inserted, and the drift tubes should be ready for welding next week. (WBS 1.4.2.3)

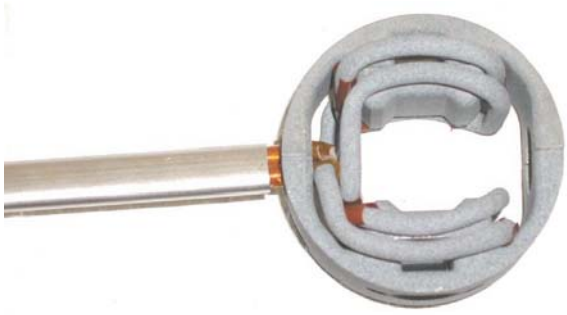

Fig. 1: Production EMD coil prior to potting and insertion into a drift tube body

Fig. 2: Test fit of a PMQ assembly into a production drift tube.

Coronado Machine has begun working on the vacuum spools and has ordered material for the DTL support stands. Integrated Machining received the material for the slug tuners and vacuum ports this week and expect to begin cutting chips early next week. Altec has also received material for the support stand struts. At this time, all of these procurements appear to be on schedule. The last DTL tanks section for Tank 3 is still scheduled to ship October 29. (WBS 1.4.2.2)

The DTL cold model drift tubes were mapped this week and we are hoping to ship the hardware to ORNL within the next two weeks. (WBS 1.4.2)

The CCL electromagnetic quadrupole coil drawing package is complete, through checking, and is being routed for approval signatures. (WBS 1.4.4.3)

The SRF electromagnetic quadrupole coil RFP is still with our procurement team. In accordance with the ASD Procurement Supplemental Guidance, we have requested that ASD review and refine the bidders list before we issue the RFP. (WBS 1.4.9.2)

FY01 closing went smoothly. We carried over 3% our FY01 BA. (WBS 1.4.6.1)

We submitted our FY02 funding package to ORNL. The funding package for WBS 1.4 is consistent with the most recent BA profile from the Project Office; less the advanced BA we received at the end of FY01. As a backup, we also submitted for ORNL's consideration an augmented funding package with 13% additional BA that would cover full funding for procurements. (WBS 1.4.6.1)

Sergey Kurennoy returned to LANL LANSCE Division this week after a successful two-year assignment with the SNS Physics Team. During his tenure, Sergey performed design and analyses for a number of systems, including the

MEBT chopper meander lines, linac beam diagnostics, and the accumulator ring injection foil assembly. We thank him for a job well done and wish him continued success on his new assignments in support of LANSCE Division. (WBS 1.4.6.7)

**ASD/JLAB: Cold Linac**

**ASD/BNL: Ring**

BNL staff traveled to IE Power in Canada to conduct a pre-award review of their bid proposal and visits to their sub-contractors' facilities for the medium range power supplies.

Tom Nehring identified various infrastructure issues related to power supply upgrades. This list was sent to ASD.

BNL/SNS participated in an ASD videoconference to review BNL's ETC estimate.

Staff participated with ASD in an ETC cost scrubbing teleconference, the subjects of which were Magnet Measurements and Collimation Systems.

Handoff criteria are being developed for the HEBT dipole magnets. ASD's Dan Stout is coordinating this effort.

Magnetic testing of the prototype 27CDM30 magnet revealed that one of its corrector windings was incorrectly wound by Danfysik. After correcting the winding error (at BNL), the magnet was retested with successful results. Minor drawing changes are being made to prevent a reoccurrence during the production run.

The design review of extraction kicker system, originally scheduled for October 18, is being rescheduled for late October. BNL will advise ASD of the new date once it becomes known.

A contract was placed with Physical Electronics for the vacuum ion pump production order.

An order was placed for a first article controller for the Ring System vacuum ion pumps. Production units will follow acceptance testing.

Work continued here at Brookhaven on first article magnets for the injection kickers and the extraction kickers.

The welding station for the Ring half-cell vacuum chambers is complete and H. Hseuh's team finished work on the first VC assembly. The chamber is now in QA for final inspections.

**Controls**

The first draft of all WBS 1.9 FY01 funding packages was completed. Work proceeds on relating these to the recently-completed ETC exercise.

At Berkeley, first beam was extracted from the Source/LEBT after major electrical rework, validating all controls changes. Design and implementation began of a sequencer to automate conditioning of windows and/or the RFQ in unattended operation.

At LANL, the LLRF CDM (Clock Distribution Module) was successfully tested with the first CDM Board. The first "Utility Module," which includes the real-time data link and will be used in every VME and VXI crate, is built at LANL and awaiting test.

At BNL, work is continuing on EPICS drivers for the Power Supply Controller and the timing system modules. Testing also began on software to control the Laser BPMs. This is a prototype system with a PC controlling the laser, motors and scope. After the hardware and software is tested, the hardware will be installed in the BNL Linac for testing with real data.

Sverdrup submitted Target Utility instrumentation drawings for the control cabinets in the Target building. These drawings include the cabinet layout, the PLC network, and the I/O wiring diagrams. Comments on these drawings are due by October 17, and a review of the design is scheduled for October 23 - 25.

Testing of the first-article Dawn 7-slot VME crate was completed at SNS/ORNL. The final versions of these crates can now be shipped (after a short list of problems is fixed). (See photo of crate below). We are still waiting for a response from Wiener re problems found with their first-article 21-slot VME crate.

At ORNL, production network hardware has been installed in a rack and awaits configuration by ORNL network support. (See photo below.) This hardware will be used to provide network services for our control system development systems. (The existing hardware was borrowed from Cisco and must be returned). Using this equipment will allow us to gain operating experience with some of the operating features planned for the ICS network.

**ASD/ORNL: Integration and Installation Support**

Received parts to build prototype DTL chase insert, plans are to fab all inserts in RATS. Received 4-402.5 water loads. Wave-guide components still continue to arrive at RATS almost daily. Received 4-transformers from BNL.

The klystron wave-guide mockup for the third DTL tank is now complete and hanging outside the Linac mock-up. All the water, air piping and HVAC units are installed in the Linac mock-up. Working on mocking up the cryo piping now. Plan to change the Ring mock-up duct bank to the latest configuration and pull cables soon.

An independent installation review was held last week in RATS. The final report will be provided later. Phil is finishing up the input for the 1st phase of the installation schedule. Tom is working on the draft installation plan that will be complete by 10/15/01.

**Accelerator Physics**

ORNL AP personnel reviewed technical requirement specifications for magnet power supply bid packages of the linac, transfer line and ring magnets.

Benchmark calculations between simulated and measured beam profiles from the PSR storage ring at LANL have been done and are encouraging. These data were taken in September at PSR, and included cases with notched beams (missing the central longitudinal portion of the injected beam), which tend to reduce the space charge broadening.

A set of ring magnet measurement requirements were drafted and sent to measurement engineers. These are being iterated.

**Operations**

This week Operations worked on:

- Development of the Commissioning Program Plan
- The Commissioning Accelerator Safety Envelope
- The Operations Procedures Manual
- Accelerator Power costs for the ETC
- Baseline Spares purchases for Partner Laboratories
- Installation and Commissioning planning issues

The editing process of the PSAD is also ongoing with the desire to develop a Final Safety Analysis Document within the next few months.

An initial "integration" meeting was held this week between members of ASD and XFD to ensure compliance with both the Accelerator Safety Order (DOE O 420.2A) and 10CFR835 for all SNS workers in both divisions.

The draft guidance to the Accelerator Safety Order (420.2A) was carefully reviewed, and in general was found to be quite well done. Comments relating to this guidance document were forwarded to DOE HQ.

**Ion Source Group**

Paul Gibson is ordering the 2 MHz RF amplifier.

In preparation for testing the optical spectrometer, Sachin Babu tested a discharge lamp and measured the current to determine the plasma parameters. The discharge is driven by 5 kV, 50 Hz AC and we observed a peak current of 16 mA, although the current went only in one direction. The optical spectrometer, the same as used by LBNL, will allow for plasma diagnostics on the SNS ion source.

Robert Welton tested successfully two of the 10-layer CP antennas with high voltage. An order for additional multi layer antennas has been placed with Cherokee Porcelain.

Hidetomo Oguri sent us the JAERI emittance data. They can be read from Snsnta\users\Stockli\data.

**RF Group**

A transmitter test plan review was held this week at Titan. The review went well with clarification given to specific items. A concise form will be generated for transmitter check out; this form must be ready by the end of the month. Acceptance testing of the 1st 402.5 MHz transmitter will be the end of November, about a month late in the schedule. There will be no impact to the schedule if testing occurs the end of November.

Testing of the 1st Marconi tube is again postponed till December?

Mark Champion was at Jlab this past week and will be at LANL next week for testing of the Jlab 1 MW transmitter.

Progress is being made on the LLRF system. Hengjie has been working with LANL and the clock distribution module is working; if no changes are made this could be the final revision to this module. LANL has 3 clock modules one is being sent to Berkeley and 2 will be used to continue development of the other LLRF modules. Hengjie is back to LANL next week. Progress on the reference line will be discussed at the next LLRF and orphan signal video to be on 22-Oct-01 at 11:00 am EDT.

The Power supply for the Jlab test stand was shipped today and should arrive next week. We will proceed with integration to the crowbar and testing. The energy storage capacitors will not arrive at ORNL till November due to a purchasing confusion.

A LLRF video will be held on 11-Oct-01 from 1 to 3 pm EDT to discuses sc cavity force detuning issues, Mark Champion will conduct this discussion.

HVCM reviews at vendors building the SCR rectifier will be held soon, maybe next week.

**Cryo Transfer Line Group**

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**Mechanical Group**

We continue to work with our partner lab (BNL) in developing a robust design for the vacuum isolation windows for the passive beam dumps. This effort is beginning to converge, specifically the exact details of the thermal dissipation capabilities and the thermal (and therefore vibrational modes) of these windows.

**Magnet Measurement Group**

**Power Supply Group**

A new employee, Teresa Toomey, joined the group this week as an engineering associate to coordinate the electrical and cabling installation activities.

Ken Rust attended a pre-award conference with the ring medium power supply vendor to validate the manufacturing process and schedule. Because of the favorable terms obtained, it has been decided to pursue the 1.3 GeV option for these power supplies.

Ken Rust also visited IE Power in Toronto Canada to assess progress on the first article injection kicker power supply.

The specifications for the DTL corrector and the CCL quadrupole power supplies have been received from LANL. Because of recent changes in the physics designs, some changes need to be made in the CCL quadrupole power supplies specifications before the procurement can proceed.

SNS Diamond Foil Project Progress Update 9/20/01 R. W. Shaw (ORNL) and C. S. Feigerle (UT/K)

In the month since our last update, we have made progress on several fronts. The UT/K hot filament reactor has been improved, film seeding has been studied, etching methods for producing "window frame" foils have been demonstrated, and ablation techniques for substrate patterning have been developed. We feel we will have an appropriate foil for a BNL beam test by October 15.

**Survey and Alignment Group**

**Beam Diagnostics Group**

LBNL beam diagnostics progress report:

The Front-end diagnostic progress includes the production of the vacuum chamber for the emittance measurement equipment. LBNL has placed an order for the major components that make up the vacuum system. They include:
Three ASA - 11 Flanges
One ASA - 11 Tee
One Adapter ASA - 11 to 4.5" Conflat
These parts are expected in two weeks and will allow us to fabricate a special length spool to set the slit to detector spacing and an adapter flange which will make the connection from the beam stop chamber to the ASA - 11 spool. The gate valve and Cryo pump are at hand. Berkeley will use for this chamber for the emittance diagnostic system. The emittance detector (HARP) is on order with Princeton Scientific and the actuator is on order with Thermionics. Delivery of both is expected before the end of October. The mechanical design layout is nearly complete, lacking only the fine detail of how we attach the detector to the actuator and the type of feed-through we will use to bring the detector information from the vacuum system. In addition, the supporting plate and the various brackets are in shops to be fabricated.

LANL beam diagnostics progress report:

BPM pickups: We are still fighting welding issues with our first two units for tank 3 of the DTL. For the CCL, SCL, and transition region the SOWs and drawing packages were handed over to the buyer to go out for bid. Bids will be for prototypes with the option to buy production runs.

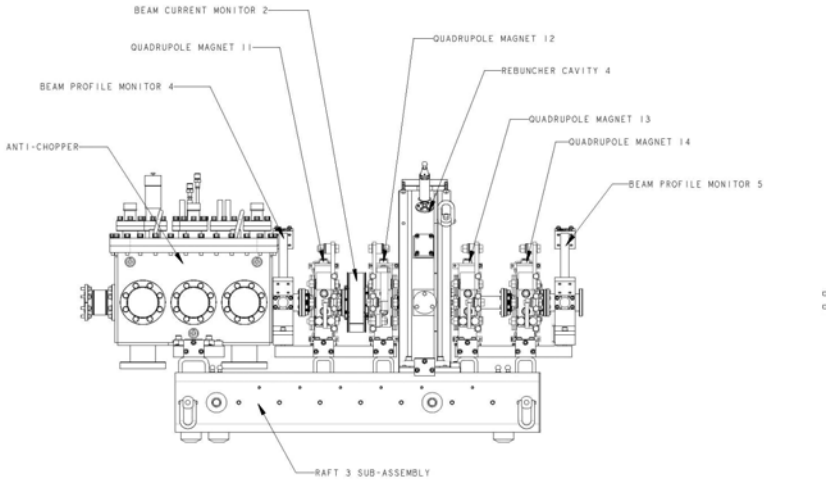
BPM electronics: The PCI motherboard is acquiring ADC data from the DFE. Preliminary results show noise floor at ~2 bits peak. One of the rack mount PCs (which will eventually go to LBNL) has been set up as a test bench for further testing in the electronics lab. Fifteen additional PCI motherboards have been received, and several are being built up for testing here and at ORNL.

Wire-scanner pickups: We began testing of the Huntington actuator prototype. The DTL and D-plate WS strokes and fork sizes are being determined.

Wire-scanner electronics: The latest version of the WS electronics board is being assembled and readied for testing. We have decided on a 1U-high chassis to house the electronics.

D-plate: We made further progress in completing the drawing packages for the DTL and D-plate Faraday cup/degraders. Prototype FC actuators are due at LANL by Oct. 12. We completed further thermal/structural analysis for the D-plate beam stop. We decided to use a simpler adapter spool piece to the DTL tank, and it is being designed. The D-plate design is now 95% complete, and 35% has been detailed.

MEBT emittance: We began to gather information to begin design of the 2.5-MeV MEBT slits (see attached assembly drawing of MEBT Raft 3). Although there is a small space between Quads 13 and 14 for installation of slits, there is no beam box there to hold them. There are many mechanical design challengers that have to be overcome prior to a sound completion of the design. For example the MEBT doesn't have the space to insert additional beam boxes without removing the anti-chopper and replacing it with a beam box (two needed for the emittance scanner system). Moreover, the provided profile-monitor boxes are mostly customized, with integrated flanges and/or bellows to cope with the little room that the lattice is offering between quadrupoles, chopper hardware, and rebunchers. Accommodating other box designs even within the available spaces would require asignificant EDI.




ORNL/SNS beam diagnostics progress report:

The entire group worked and completed the LANL hand-off Acceptance Strategy document. This document is organized to cover the production and successful installation and commissioning of each diagnostic system rather than only LANL responsibilities. Saeed is working with the AP group on updating the physics requirements of the diagnostics. He is also assisting LANL in preparation of the response to the wire scanner review by the diagnostic review committee. Craig is in a process of getting parts for the BPM test stand and fast Faraday cup. Dave and Saeed are working with BNL accelerator physics group to update the Ring diagnostic database. BNL reported a successful test of the PLL tune meter. Alternative design of the ion chambers using parallel plates rather than coaxial geometries are being investigated by BNL to improve the linear response of the beam loss monitor detectors.

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